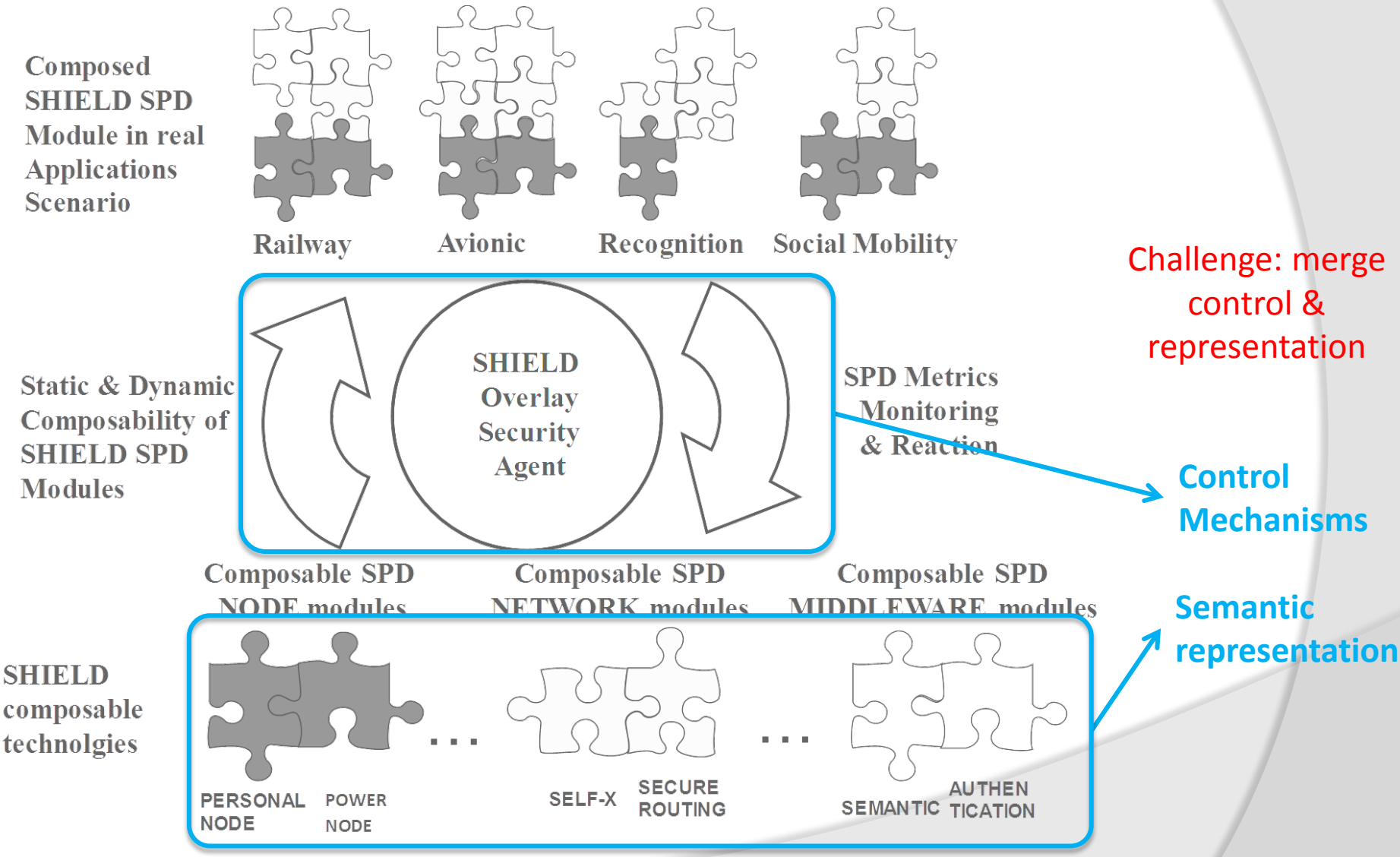
2nd Annual review
Florence 15 November 2013

New development & composability

Andrea Fiaschetti – Univ. "La Sapienza"

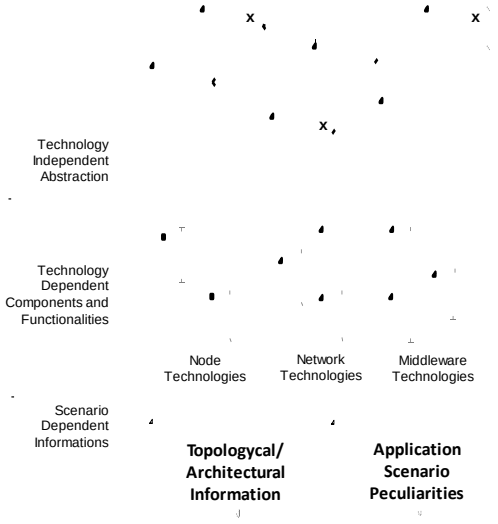
ARTEMIS

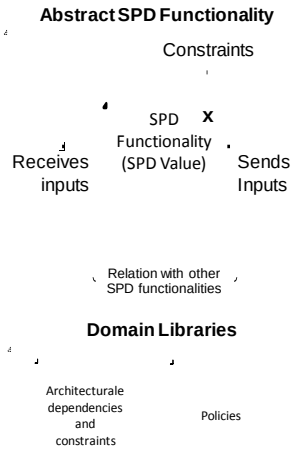
Overlay Composability: what's new?



Semantic representation: nSHIELD achievements 1/2

- **Simplification of the semantic approach** by means of **a SINGLE model**
- A component is at the same time provider of vulnerabilities and means of mitigation: no separate models or reasoning is needed

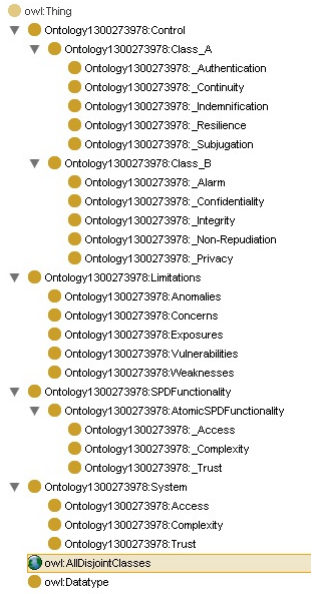


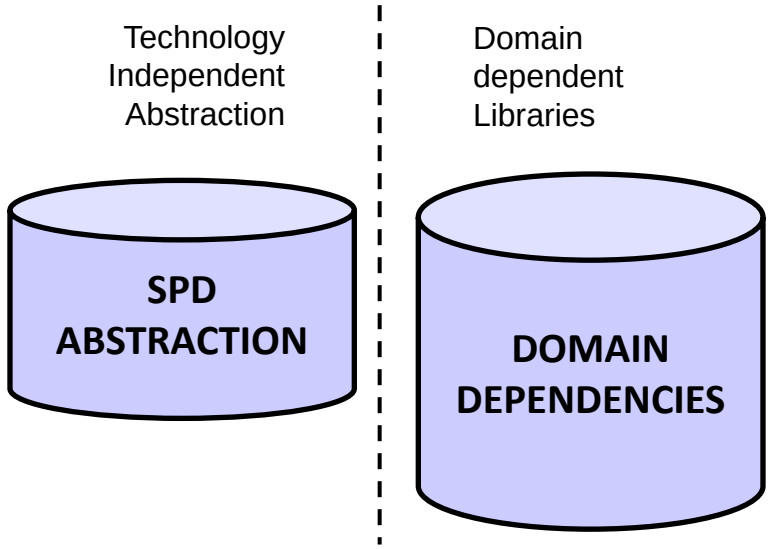


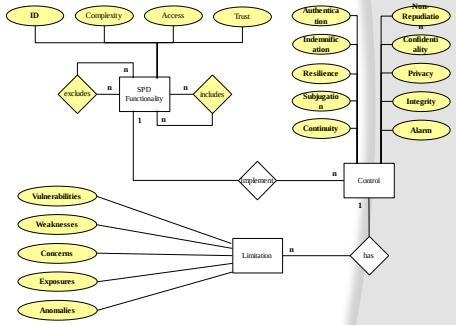
Semantic representation: nSHIELD achievements 2/2

Decoupling between

- Information used to compute the configuration of SPD functionalities and
- Information used to implement the configuration and tailor it to the scenario needs







- SPD Abstraction is natively present into a SHIELD component
- Domain dependencies are manually configured during system deployment

nSHIELD

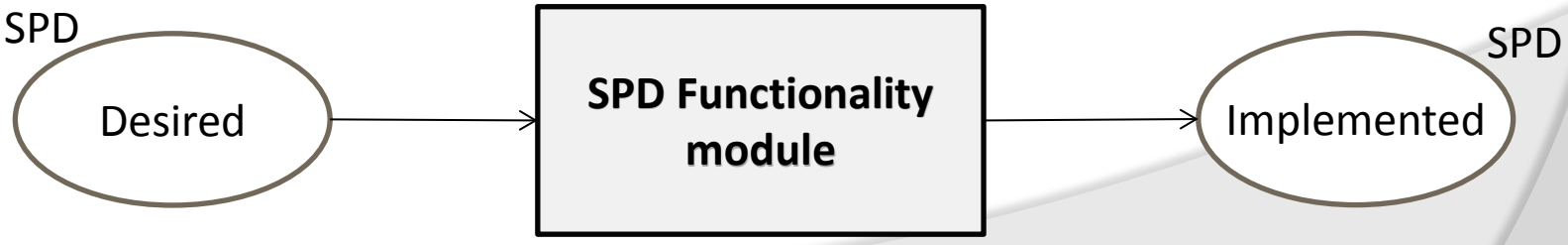
Composition Algorithms: nSHIELD starting point 1/2

Colored Petri Nets

- Colored Petri Nets (CPNs) is an extension to Petri Nets developed to model complex systems.
- CPNs combine the PNs structure with the high-level programming capabilities
- The hierarchical structure is the strength of CPNs, the sub-modules composition allows to model complex system and to work at different abstraction level

System Model

- To model an heterogeneous and complex system is necessary a scalable structure to overcome state explosion
- The system basic element are *SPD functionality module*
  - > Input state contains an SPD token that represents the desired value i.e. desired metrics (number) and/or specific implementation (string)
  - > Output state represent the current state (if/how the SPD functionality is implemented).



Composition Algorithms : nSHIELD starting point 2/2

Means to mitigate threaths or SPD level Translated into tokens

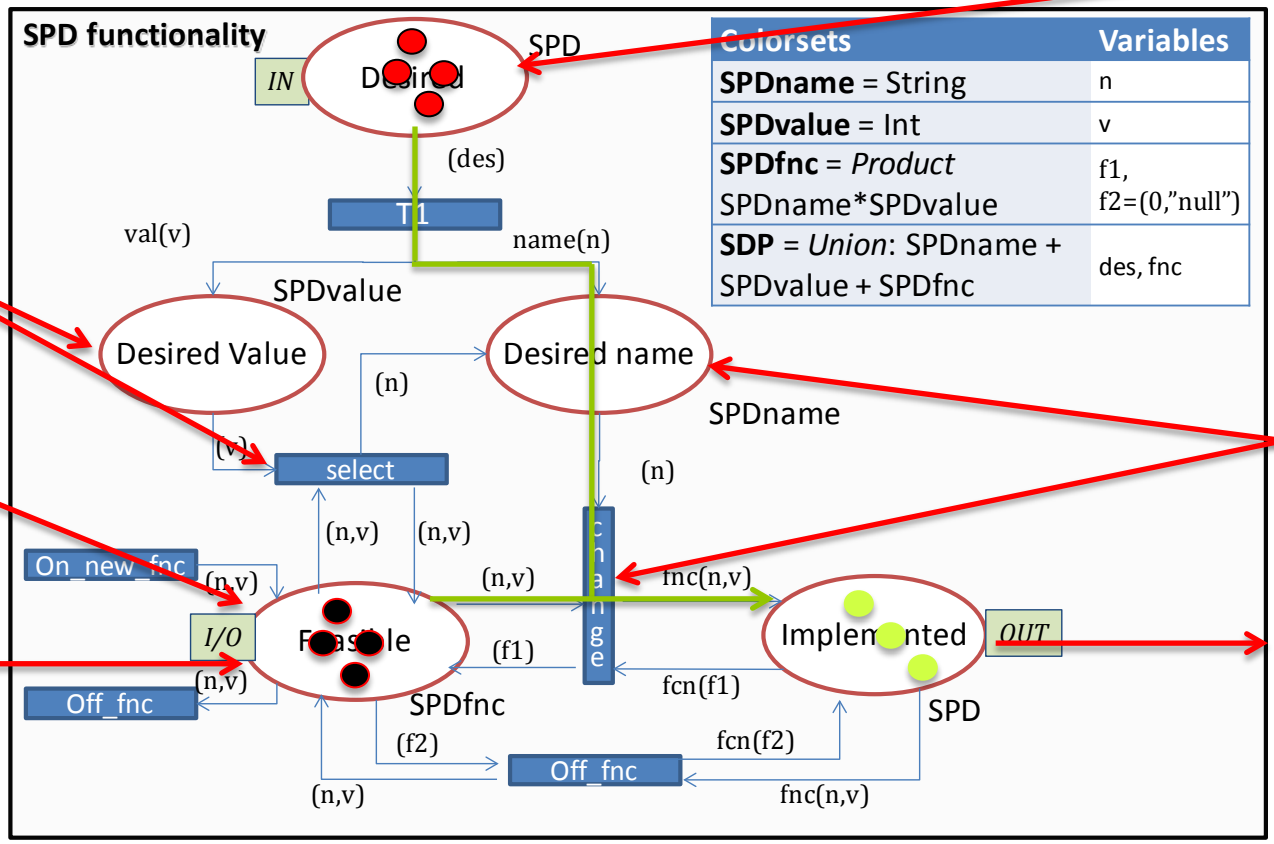
Metric Evaluation

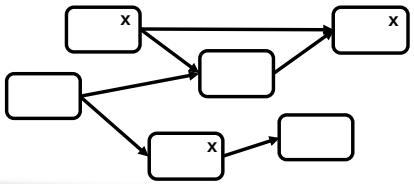
Context Information

Available SPD functionalities Translated into tokens

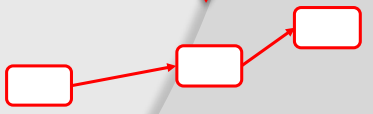
Policy Enforcement

Back to enforcement engine





FROM «PROBLEM» TO «SOLUTION»

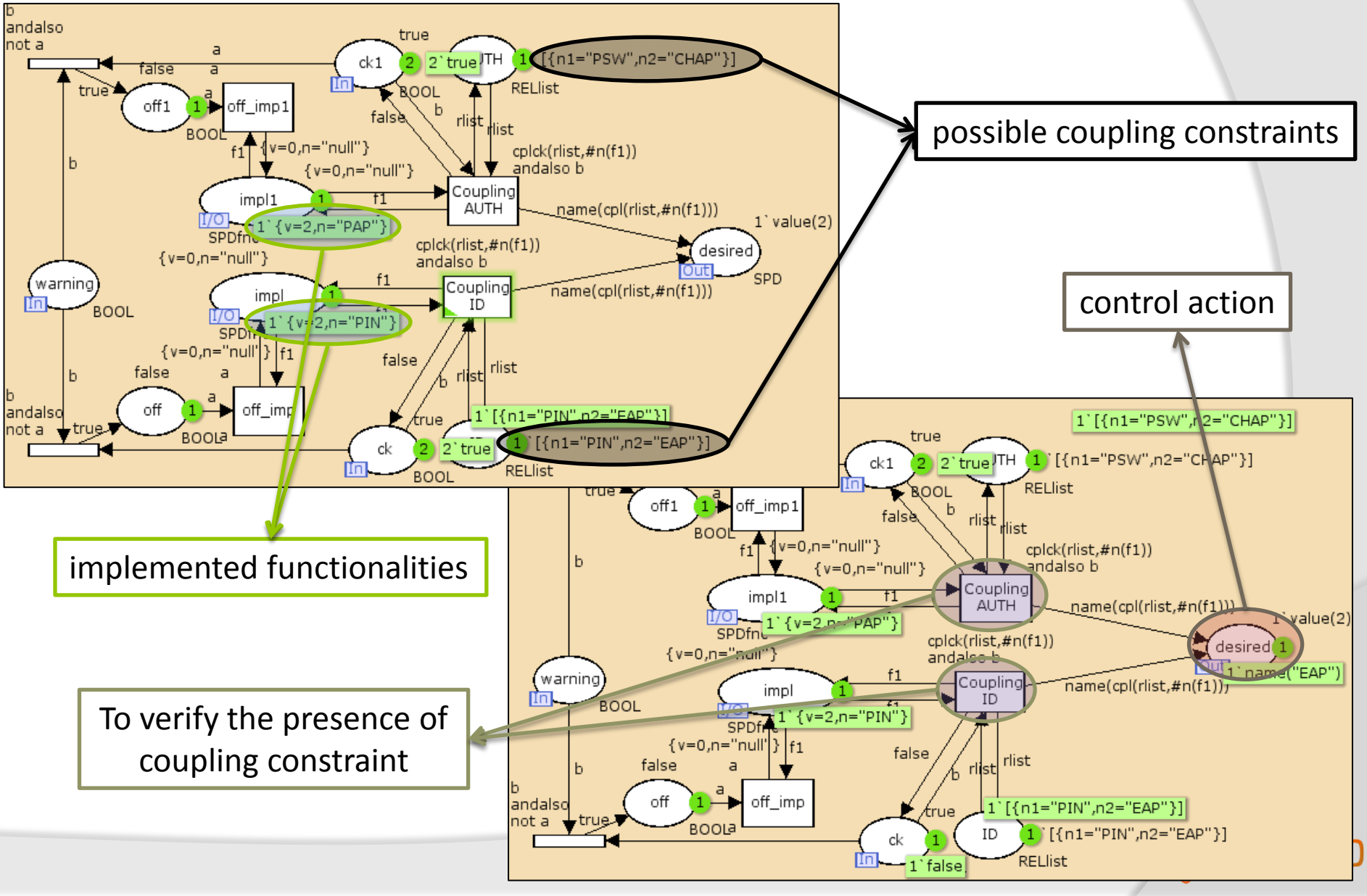


nSHIELD

Composition Algorithms: Achievements 1/2

- The interaction between functionalities has been modelled through the coupling relation box
- The Coupling Relation block contains the list of possible coupling constraints on functionality.
- This block takes the implemented functionalities as input, verifies the presence of coupling constraint and produces a control action as output.
- The control action aims to address any coupling constraint by positioning a new token, that carries the name of the implementation to be enabled in order to satisfy the constraint, in the place *Desired.*
- This token drives the system to satisfy the constraint if the new desired implementation (carried by token) is available and satisfies the required SPD level. If this condition is not verified then the coupling block “turns off” the implementation that required the coupling. Thus the system actives a new implementation to achieve the desired level of SPD, obviously if at least one is available.

Composition Algorithms: Achievements 2/2



Overlay composability: conclusions

Achievements

- Further simplification of the semantic model to shorten the logical chain
- Semantic (abstraction) model 100% compliant with metrics approach
- Composition algorithms (CPN) fully based on abstract SPD functionalities
- Relation between functionalities modelled throug CPN as well

Breackhtrough:

- Less theory… more practical approaches: all the solution can be easily implemented in a software system

Way to go ahead:

- Instantiate the Ontology with the demonstrator's entities
- Model also the mutual exclusion relation with CPN
- Examine the possibility of performing heuristic or optimization directly on the Ontology withouth passing through CPN

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Thanks for your attention

Any questions?

Andrea Fiaschetti